CLAIMS

The claimed subject matter is:

1. A contact assembly for plating a layer on a microelectronic workpiece, comprising:

a support member having an opening configured to receive a microelectronic workpiece;

a contact system carried by the support member, the contact system having a plurality of electrically conductive contact members projecting inwardly into the opening;

a shield carried by the support member to prevent electroplating solution from engaging the contact members, the shield projecting from the support member to extend under the contact members and into opening, and the shield including a lip region in the opening inwardly of the contact members; and

an elastomeric seal molded onto the lip region of the shield to adhere the seal to the shield.

2. The contact assembly of claim 1 wherein the shield is composed of polyetheretherketone and the seal is composed of a fluoroelastomer.

3. The contact assembly of claim 1 wherein the shield is composed of polyetheretherketone and the seal is composed of a perfluoroelastomer.

4. The contact assembly of claim 1 wherein the shield is composed of polyvinylidene fluoride and the seal is composed of a fluoroelastomer.

5. The contact assembly of claim 1 wherein the shield is composed of polyvinylidene fluoride and the seal is composed of a perfluoroelastomer.

6. The contact assembly of claim 1 wherein the contact assembly further comprises an adhesive between the seal and the shield.

7. The contact assembly of claim 1 wherein the lip region of the shield and the seal have a thickness of not greater than approximately 0.1 inch.

8. The contact assembly of claim 1 wherein the lip region of the shield and the seal have a thickness of not greater than approximately 0.085 inch.

9. The contact assembly of claim 1 wherein the seal has a width of not greater than approximately 0.055 inch.

10. The contact assembly of claim 1 wherein the seal has a width of not greater than approximately 0.035 inch.

11. The contact assembly of claim 1 wherein:

the support member comprises an annular ring composed of a conductive material;

the contact system comprises a ring contact having an annular base attached to the support member and a plurality of fingers projecting generally radially inwardly from the base into the opening, the contact ring being composed of a conductive material; and

the shield comprises a dielectric material attached to the support member.

12. The contact assembly of claim 1 wherein:

the support member comprises an annular ring composed of a conductive material;

the contact system comprises a ring contact having an annular section attached to the support member and a plurality of fingers swept at an angle relative to a radius of the support member; and

the shield comprises a dielectric material attached to the support member to electrically isolate the support member from an electroplating solution.

13. The contact assembly of claim 1 wherein:

the shield has a plurality of apertures through the lip region; and

the seal has an upper section on the lip region and a lower section in the apertures.

14. The contact assembly of claim 1 wherein:

the support member comprises an annular ring composed of a conductive material;

the contact system comprises a ring contact having an annular section attached to the support member and a plurality of fingers swept at an angle relative to a radius of the support member, wherein the fingers each have a contact site configured to electrically contact the workpiece and a dielectric coating around the contact site; and

the shield comprises a dielectric material attached to the support member to electrically isolate the support member from an electroplating solution.

15. A contact assembly for plating a layer on a microelectronic workpiece, comprising:

a support member having an opening configured to receive a microelectronic workpiece;

a contact system carried by the support member, the contact system having a plurality of electrically conductive contact members projecting from the support member to contact sites;

a shield carried by the support member to prevent electroplating solution from engaging the contact members, the shield being a flexible member extending under the contact members to an interior location of the opening inwardly of the contact members, and the shield having an inner edge inward of the contact sites of the contact members and a boundary line between the inner edge and the contact sites; and

an elastomeric seal adhered to the lip of the shield, the seal having a first edge at the inner edge of the shield and a second edge at the boundary line of the shield that defines an outermost perimeter of the seal.

16. The contact assembly of claim 15 wherein:

the support member comprises an annular ring composed of a conductive material;

the contact system comprises a ring contact having an annular base attached to the support member and a plurality of fingers projecting generally radially inwardly from the base into the opening, the contact ring being composed of a conductive material; and

the shield comprises a dielectric material attached to the support member.

17. The contact assembly of claim 15 wherein:

the support member comprises an annular ring composed of a conductive material;

the contact system comprises a ring contact having an annular section attached to the support member and a plurality of fingers swept at an angle relative to a radius of the support member; and

the shield comprises a dielectric material attached to the support member to electrically isolate the support member from an electroplating solution.

18. The contact assembly of claim 15 wherein:

the shield has a plurality of apertures; and

the seal has an upper section on the shield and a lower section in the apertures.

19. The contact assembly of claim 15 wherein:

the support member comprises an annular ring composed of a conductive material;

the contact system comprises a ring contact having an annular section attached to the support member and a plurality of fingers swept at an angle relative to a radius of the support member, wherein the fingers each have a contact site configured to electrically contact the workpiece and a dielectric coating around the contact site; and

the shield comprises a dielectric material attached to the support member to electrically isolate the support member from an electroplating solution.

20. The contact assembly of claim 15 wherein the shield and the seal have a thickness of not greater than approximately 0.085 inch.

21. The contact assembly of claim 15 wherein the seal has a width of not greater than approximately 0.055 inch.

22. A contact assembly for plating a layer on microelectronic workpiece, comprising:

a support member having an opening configured to receive a microelectronic workpiece;

a plurality of contact members carried by the support member, the contact members being a plurality of fingers projecting inwardly into the opening, and the fingers having contact sites;

a shield carried by the support member, the shield extending under the contact members and projecting radially inwardly into the opening of the support member to an interior location radially inwardly of the contact sites; and

a seal attached to the interior location of the shield, wherein the seal is molded onto the shield.

23. The contact assembly of claim 22 wherein:

the support member comprises an annular ring composed of a conductive material;

the contact members comprise fingers projecting from an annular base attached to the support member, wherein the fingers project generally radially inwardly from the base into the opening, and the base is composed of a conductive material; and

the shield comprises a dielectric material attached to the support member.

24. The contact assembly of claim 22 wherein:

the support member comprises an annular ring composed of a conductive material;

the contact members comprise fingers projecting from an annular section attached to the support member, wherein the fingers are swept at an angle relative to a radius of the support member; and

the shield comprises a dielectric material attached to the support member to electrically isolate the support member from an electroplating solution.

25. The contact assembly of claim 22 wherein:

the shield has a plurality of apertures; and

the seal has an upper section on the shield and a lower section in the apertures.

26. The contact assembly of claim 22 wherein the contact members each have a contact site configured to electrically contact the workpiece and a dielectric coating around the contact site.

27. A contact assembly for plating a layer on microelectronic workpiece, comprising:

a support member having an opening configured to receive a microelectronic workpiece wherein the support member is composed of a conductive material;

a plurality of contact members carried by the support member, the contact members being a plurality of fingers projecting inwardly into the opening, and the fingers having contact sites;

a shield carried by the support member, the shield extending under the contact members and projecting radially inwardly into the opening of the support member to an interior location radially inwardly of the contact sites, wherein the shield is composed of a dielectric material; and

a seal attached to the interior location of the shield, wherein the seal is molded onto the shield and the seal is composed of an elastomer.

28. A contact assembly for plating a layer on microelectronic workpiece, comprising:

a support member having an opening configured to receive a microelectronic workpiece;

a plurality of contact members carried by the support member, the contact members being a plurality of fingers projecting inwardly into the opening, and the fingers having contact sites;

a shield carried by the support member, the shield extending under the contact members and projecting radially inwardly into the opening of the support member to an interior location radially inwardly of the contact sites; and

a seal attached to the interior location of the shield, the seal being molded onto the shield, and the seal having a width of approximately 0.02 - 0.04 inch.

29. A contact assembly for plating a layer on microelectronic workpiece, comprising:

a support member having an opening configured to receive a microelectronic workpiece;

a plurality of contact members carried by the support member, the contact members being a plurality of fingers projecting inwardly into the opening, and the fingers having contact sites;

a shield carried by the support member, the shield extending under the contact members and projecting radially inwardly into the opening of the support member to an interior location radially inwardly of the contact sites; and

a seal attached to the interior location of the shield, the seal being molded onto the shield, the seal having a width of approximately 0.02 - 0.04 inch, and the seal and the interior location of the shield having a thickness of approximately 0.04 - 0.10 inch.

30. A contact assembly for use in an electrochemical deposition system to apply an electrical potential to a microelectronic workpiece, the contact assembly comprising:

a support member having an opening configured to receive the workpiece;

a contact system carried by the support member, the contact system having a plurality of contact members projecting inwardly into the opening relative to the support member, wherein the contact members each have a contact site configured to electrically contact the workpiece and a dielectric coating around the contact site;

a shield carried by the support member, the shield projecting from the support member to extend under the contact members and into the opening, and the shield including a lip region inwardly of the contact members; and

an elastomeric seal on the lip region of the shield.

31. The contact assembly of claim 30 wherein the contact members comprise cantilevered spring elements projecting upwardly into the opening.

32. The contact assembly of claim 30 wherein the contact members comprise cantilevered spring elements projecting upwardly into the opening, and the cantilevered spring elements have a raised feature.

33. The contact assembly of claim 30 wherein the contact members comprise cantilevered spring elements projecting upwardly into the opening, and the cantilevered spring elements have a raised feature comprising a deformed section of the spring elements.

34. The contact assembly of claim 30 wherein:

the support member comprises a conductive support ring and a dielectric coating on at least a portion of the support ring;

the contact system further comprises a conductive mounting section attached directly to the support ring; and

the contact members are fingers integral with the mounting section.

35. The contact assembly of claim 34 wherein the mounting section comprises an arcuate element and the fingers project inwardly from the arcuate element along a radius of the support ring.

36. The contact assembly of claim 34 wherein the mounting section comprises an arcuate element and the fingers project inwardly from the arcuate element along a radius of the support ring, and the fingers have a raised contact feature.

37. The contact assembly of claim 34 wherein the mounting section comprises an arcuate element and the fingers project inwardly from the arcuate element at an angle relative to a radius of the support ring.

38. The contact assembly of claim 34 wherein the mounting section comprises an arcuate element and the fingers project inwardly from the arcuate element at an angle relative to a radius of the support ring, and the fingers have a raised contact feature.

39. The contact assembly of claim 30 wherein:

the support member comprises an annular ring composed of a conductive material;

the contact system comprises a ring contact having an annular base attached to the support member and a plurality of fingers projecting generally radially inwardly from the base into the opening, the contact ring being composed of a conductive material; and

the shield comprises a dielectric material attached to the support member.

40. The contact assembly of claim 30 wherein:

the support member comprises an annular ring composed of a conductive material;

the contact system comprises a ring contact having an annular section attached to the support member and a plurality of fingers swept at an angle relative to a radius of the support member; and

the shield comprises a dielectric material attached to the support member to electrically isolate the support member from an electroplating solution.

41. The contact assembly of claim 30 wherein:

the shield has a plurality of apertures through the lip region; and

the seal has an upper section on the lip region and a lower section in the apertures.

42. The contact assembly of claim 34 wherein:

the support member comprises an annular ring composed of a conductive material;

the contact system comprises a ring contact having an annular section attached to the support member and a plurality of fingers swept at an angle relative to a radius of the support member, wherein the fingers each have a contact site configured to electrically contact the workpiece and a dielectric coating around the contact site; and

the shield comprises a dielectric material attached to the support member to electrically isolate the support member from an electroplating solution.

43. A reactor system for electroplating microelectronic workpieces, comprising:

a bowl configured to hold a plating solution;

an anode in the bowl at a location to contact the plating solution;

a head assembly moveable relative to the bowl between a first position to load/unload a workpiece and a second position to place at least a portion of the workpiece in the plating solution; and

a contact assembly comprising a support member having an opening configured to receive a microelectronic workpiece; a contact system carried by the support member, the contact system having a plurality of electrically conductive contact members projecting inwardly into the opening; a shield carried by the support member to prevent electroplating solution from engaging the contact members, the shield projecting from the support member to extend under the contact members and into opening, and the shield including a lip region in the opening inwardly of the contact members; and an elastomeric seal molded onto the lip region to adhere the seal to the shield.

44. The contact assembly of claim 43 wherein the shield is composed of polyetheretherketone and the seal is composed of a fluoroelastomer.

45. The contact assembly of claim 43 wherein the shield is composed of polyetheretherketone and the seal is composed of a perfluoroelastomer.

46. The contact assembly of claim 43 wherein the shield is composed of polyvinylidene fluoride and the seal is composed of a fluoroelastomer.

47. The contact assembly of claim 43 wherein the shield is composed of polyvinylidene fluoride and the seal is composed of a perfluoroelastomer.

48. The contact assembly of claim 43 wherein the contact assembly further comprises an adhesive between the seal and the shield.

49. The contact assembly of claim 43 wherein the lip region of the shield and the seal have a thickness of not greater than approximately 0.1 inch.

50. The contact assembly of claim 43 wherein the lip region of the shield and the seal have a thickness of not greater than approximately 0.085 inch.

51. The contact assembly of claim 43 wherein the seal has a width of not greater than approximately 0.055 inch.

52. The contact assembly of claim 43 wherein the seal has a width of not greater than approximately 0.035 inch.

53. The contact assembly of claim 43 wherein:

the support member comprises an annular ring composed of a conductive material;

the contact system comprises a ring contact having an annular base attached to the support member and a plurality of fingers projecting generally radially inwardly from the base into the opening, the contact ring being composed of a conductive material; and

the shield comprises a dielectric material attached to the support member.

54. The contact assembly of claim 43 wherein:

the support member comprises an annular ring composed of a conductive material;

the contact system comprises a ring contact having an annular section attached to the support member and a plurality of fingers swept at an angle relative to a radius of the support member; and

the shield comprises a dielectric material attached to the support member to electrically isolate the support member from an electroplating solution.

55. The contact assembly of claim 43 wherein:

the shield has a plurality of apertures through the lip region; and

the seal has an upper section on the lip region and a lower section in the apertures.

56. The contact assembly of claim 43 wherein:

the support member comprises an annular ring composed of a conductive material;

the contact system comprises a ring contact having an annular section attached to the support member and a plurality of fingers swept at an angle relative to a radius of the support member, wherein the fingers each have a contact site configured to electrically contact the workpiece and a dielectric coating around the contact site; and

the shield comprises a dielectric material attached to the support member to electrically isolate the support member from an electroplating solution.

57. A reactor system for electroplating microelectronic workpieces, comprising:

a bowl configured to hold a plating solution;

an anode in the bowl at a location to contact the plating solution;

a head assembly moveable relative to the bowl between a first position to load/unload a workpiece and a second position to place at least a portion of the workpiece in the plating solution; and

a contact assembly comprising a support member having an opening configured to receive a microelectronic workpiece; a contact system carried by the support member, the contact system having a plurality of electrically conductive contact members projecting inwardly into the opening; a shield carried by the support member to prevent electroplating

solution from engaging the contact members, the shield being a flexible member extending under the contact members to an interior location of the opening inwardly of the contact members, and the shield having lip region in the opening inwardly of the contact members; and an elastomeric seal adhered to the lip region of the shield, the seal having a first edge at an inner edge of the lip region and a second edge at a boundary line of the shield between the inner edge and the contact members, wherein the second edge of the seal defines an outer perimeter of the seal.

58. The contact assembly of claim 57 wherein:

the support member comprises an annular ring composed of a conductive material;

the contact system comprises a ring contact having an annular base attached to the support member and a plurality of fingers projecting generally radially inwardly from the base into the opening, the contact ring being composed of a conductive material; and

the shield comprises a dielectric material attached to the support member.

59. The contact assembly of claim 57 wherein:

the support member comprises an annular ring composed of a conductive material;

the contact system comprises a ring contact having an annular section attached to the support member and a plurality of fingers swept at an angle relative to a radius of the support member; and

the shield comprises a dielectric material attached to the support member to electrically isolate the support member from an electroplating solution.

60. The contact assembly of claim 57 wherein:

the shield has a plurality of apertures through the lip region; and

the seal has an upper section on the lip region and a lower section in the apertures.

61. The contact assembly of claim 57 wherein the contact members each have a contact site configured to electrically contact the workpiece and a dielectric coating around the contact site.

62. The contact assembly of claim 57 wherein the lip region of the shield and the seal have a thickness of not greater than approximately 0.085 inch.

63. The contact assembly of claim 57 wherein the seal has a width of not greater than approximately 0.055 inch.

64. A reactor system for electroplating microelectronic workpieces, comprising:

a bowl configured to hold a plating solution;

an anode in the bowl at a location to contact the plating solution;

a head assembly moveable relative to the bowl between a first position to load/unload a workpiece and a second position to place at least a portion of the workpiece in the plating solution; and

a contact assembly comprising a support member having an opening configured to receive a microelectronic workpiece; a plurality of contact members carried by the support member, the contact members being a plurality of fingers projecting inwardly into the opening, and the fingers having contact sites; a shield carried by the support member, the shield extending under the contact members and projecting radially inwardly into the opening of the support member to an interior location radially inwardly of the contact sites; and a seal attached to the interior location of the shield, wherein the seal is molded onto the shield.

65. The contact assembly of claim 64 wherein:

the support member comprises an annular ring composed of a conductive material;

the contact members are integral with an annular base attached to the support member and project generally radially inwardly from the base into the opening, the annular base being composed of a conductive material; and

the shield comprises a dielectric material attached to the support member.

66. The contact assembly of claim 64 wherein:

the support member comprises an annular ring composed of a conductive material;

the contact members are integral with an annular section attached to the support member and project inwardly at an angle relative to a radius of the support member; and

the shield comprises a dielectric material attached to the support member to electrically isolate the support member from an electroplating solution.

67. The contact assembly of claim 64 wherein:

the shield has a plurality of apertures; and

the seal has an upper section on the shield and a lower section in the apertures.

68. A reactor system for electroplating microelectronic workpieces, comprising:

a bowl configured to hold a plating solution;

an anode in the bowl at a location to contact the plating solution;

a head assembly moveable relative to the bowl between a first position to load/unload a workpiece and a second position to place at least a portion of the workpiece in the plating solution; and

a contact assembly comprising a support member having an opening configured to receive a microelectronic workpiece; a plurality of contact members carried by the support member, the contact members being a plurality of fingers projecting inwardly into the opening, and the fingers having contact sites; a shield carried by the support member, the shield extending under the contact members and projecting radially inwardly into the opening of the support member to an interior location radially inwardly of the contact sites, wherein the shield is composed of a plastic; and a seal attached to the interior location of the shield, wherein the seal is molded onto the shield and the seal is composed of an elastomer.

69. A reactor system for electroplating microelectronic workpieces, comprising:

a bowl configured to hold a plating solution;

an anode in the bowl at a location to contact the plating solution;

a head assembly moveable relative to the bowl between a first position to load/unload a workpiece and a second position to place at least a portion of the workpiece in the plating solution; and

a contact assembly comprising a support member having an opening configured to receive a microelectronic workpiece; a plurality of contact members carried by the support member, the contact members being a plurality of fingers projecting inwardly into the opening, and the fingers having contact sites; a shield carried by the support member, the shield extending under the contact members and projecting radially inwardly into the opening of the support member to an interior location radially inwardly of the contact sites; and a seal attached to the interior location of the shield, the seal being molded onto the shield, and the seal having a width of approximately 0.02 - 0.04 inch.

70. A reactor system for electroplating microelectronic workpieces, comprising:

a bowl configured to hold a plating solution;

an anode in the bowl at a location to contact the plating solution;

a head assembly moveable relative to the bowl between a first position to load/unload a workpiece and a second position to place at least a portion of the workpiece in the plating solution; and

a contact assembly comprising a support member having an opening configured to receive a microelectronic workpiece; a plurality of contact members carried by the support member, the contact members being a plurality of fingers projecting inwardly into the opening, and the fingers having contact sites; a shield carried by the support member, the shield extending under the contact members and projecting radially inwardly into the opening of the support member to an interior location radially inwardly of the contact sites; and a seal attached to the interior location of the shield, the seal being molded onto the shield, the seal having a width of approximately 0.02 - 0.04 inch, and the seal and the interior location of the shield having a thickness of approximately 0.04 - 0.10 inch.

71. A method of manufacturing a contact assembly for electroplating material onto a microelectronic workpiece, comprising:

providing a support member having an opening and a plurality of electrically conductive contact members carried by the support member;

providing a shield having a lip region;

molding a seal onto the lip region of shield, the seal being an elastomer; and

attaching the shield with the seal to the support member, wherein at least a portion of the seal is positioned in the opening inwardly of the electrically conductive contact members carried by the support member.

72. A method of manufacturing a contact assembly for electroplating material onto a microelectronic workpiece, comprising:

providing a shield having a lip region;

molding a seal onto the lip region of shield by placing an elastomeric insert into a mold, engaging the mold with the shield so that the elastomeric insert is positioned at the lip region, and heating the mold; and

attaching the shield with the seal to a support member having an opening, wherein at least a portion of the seal is positioned in the opening inwardly of electrically conductive contact members carried by the support member.